

## PATENT SPECIFICATION

DRAWINGS ATTACHED

949,954



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Date of filing Complete Specification: March 23, 1962.

Application Date: Dec. 23, 1960.

No. 44329/60.

Complete Specification Published: Feb. 19, 1964.

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Index at acceptance:—B2, F(4, 7, X9).

International Classification:—B 05.

## COMPLETE SPECIFICATION

A new or improved method of or apparatus for producing  
a Liquid Spray

We, THE A.P.V. COMPANY LIMITED, a Company organised under the laws of Great Britain, of Manor Royal, Crawley, Sussex, do hereby declare the invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the production of liquid sprays. In the past it has been usual to produce a spray by spray nozzles of one kind or another in all of which the liquid flow is forced through restricting flow passages or openings. However, such nozzles are unsatisfactory for use when the liquid contains small particles for in such a case the flow passages become choked by the particles. One particular case with which the invention is concerned arises in the brewing industry in which it is required to spray wort (whether sweet or hopped wort) over a filter bed; in such a case spray nozzles have been found to be unreliable for the reason stated.

The invention consists in producing a liquid spray by the method which consists in feeding under pressure and towards one another two columns of the liquid so that columns collide and create a lateral spray at their zone of collision, and subjecting the two columns respectively to pulsating pressure actions of different phase.

The invention further consists in spray producing apparatus comprising a duct having in its wall between its ends an opening, means to supply liquid under pressure into the opposite ends of the duct and means to subject the columns of liquid fed in to pulsating pressure actions of different phase.

It has been found that by varying the phasing of the pulsing action on the two columns the zone of collision will shift along the duct within the limits set by the opening and spray will spread at an angle to the flow axis of the lateral spray which is created by a non-pulsed

flow; the angle leads and lags the non pulsed flow axis alternately as a pulse is applied first to one column and then to the other. By varying the phase relationship of the pulsing action on the two columns a fine control can be obtained of the angle of spread covered by the spray.

As the spray is produced by the head-on collision of the two columns, the difficulties arising with the normal spray nozzles are entirely overcome and the invention can be successfully employed for effecting the spraying of liquids with a relatively large particle content such as arises in the case of brewers wort.

To carry the method into practical effect the liquid to be sprayed is fed under pressure to the opposite ends of a duct having between its ends an opening in its wall: this opening would be of substantial area and would be disposed in an angular position (about the axis of the duct) depending on the zone over which the spray produced by the collision is to be distributed. The wall of the duct will serve to direct the two columns of liquid formed by the feed from the opposite ends of the duct into head-on collision and to confine the resulting spray except in the region of the slot through which the spray passes laterally, the slot serving to control the width of the spray and of course its direction.

The two columns of liquid can be supplied from a single supply pipe which is branched to divide the supply to the opposite ends of the duct which can be formed quite simply by a pipe conveniently of circular cross-section. In such a case when the pulsing action is required any of the known pulsing devices can be disposed to act respectively on the liquid flows after the single supply has been divided or alternatively the supply from the common supply can be effected in alternation to the two ends of the duct as by the operation of a rotary valve.

The invention is illustrated in the accom-

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panying drawing in which fig. 1 is a diagrammatic view of a duct operating in accordance with the invention, fig. 2 is a diagrammatic view of an installation incorporating the invention and fig. 3 is a section showing the distribution of the spray.

Referring to the drawing there is employed a duct 1 having between its ends an opening 2 in its wall. The liquid to be sprayed is supplied under pressure through supply lines, 3, 4 to opposite ends of the duct 1 as indicated by the arrows so that the liquid columns which are contained by the duct 1 collide in the region of the opening 2 through which passes the lateral spray indicated at 5 resulting from the collision.

To achieve control of the angle of spread of the spray, provision is made to subject the columns of liquid to a pulsating action. It will be clear that when the pressures of the two columns are equal the spray will issue in a direction normal to the direction of flow in the duct 1 as indicated by the spray line 5: if however the two opposed columns are at different pressures the spray line 5 will move to the lines 6 or 7. It will be understood that the spray line will be inclined at an acute angle with the lower pressure column. In this way oscillation of the spray jet (i.e. of the spray line 5) can be achieved. Such oscillation can be produced in various ways: in fig. 2 two spray control means are shown: in one a rotary valve 8 is dispersed in a common supply line 9 from which the supply lines 3, 4 are branched: in the other valves 10, 11 are fitted in the branch lines 3, 4 these valves being operated sequentially to produce the required change in the pressure of the two opposed columns.

The method of this invention is obviously applicable to controlling a number of independent sprays and for this purpose the various

spray producers could have their controls (e.g. the valves 8) gauged for operation as by a motor.

The invention is, however, especially applicable for use in the production of beer and especially in the mashing stage in which liquid is caused to pass through a filter bed of one sort or another to produce a wort which can be either sweet wort or hot wort; by reason of the formation of the spray means of this invention the possibility of choking by reason of the contained solids or semi-solids in the spray is minimised if not entirely avoided.

#### WHAT WE CLAIM IS:—

1. Producing a liquid spray by the method which consists in feeding under pressure and towards one another two columns of the liquid so that columns collide and create a lateral spray at their zone of collision, and subjecting the two columns respectively to pulsating pressure actions of different phase.

2. Spray producing apparatus comprising a duct having in its wall between its ends an opening, means to supply liquid under pressure into the opposite ends of the duct and means to subject the columns of liquid fed in to pulsating pressure actions of different phase.

3. Apparatus as claimed in claim 2, and wherein the pulsating pressure producing means are controllable to vary the phase relationship of the pulsations they produce.

4. Apparatus as claimed in claim 2 or 3, comprising a branched conduit, having two branches re-combining to form the said duct.

5. Producing liquid spray by the method substantially as described.

6. A liquid spray apparatus substantially as described with reference to the accompanying drawing.

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COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of  
the Original on a reduced scale

